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Kentucky's Teacher Quality Measures and Fourth-Grade Reading Achievement:

A Secondary Analysis of 2002-2009 NAEP Data

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Abstract

This study examined the increase from 2007-2009 in Kentucky's fourth- grade NAEP reading scores. This increase was notable because it came after a fifteen-year period of no change. This analysis of change included composite and subscale -- *Reading Literary Experience* and *Reading to Gain Information*--scores. Differences in composite average scale scores by Teacher Quality variables were explored. Gender was included as a variable for analysis of both composite and subscale scores as gender gaps have been persistent in Kentucky's reading assessments. This secondary analysis used NAEP Data Tool with additional calculations of effect size (Cohen's *d*). There was a significant ($p.<.05$) increase in Kentucky 4th –Grade Reading scores from 2007 and 2009 with small effect size (d=0.12). Statistically significant ($p.<.05$) differences by Teacher Quality variables were: (1) reading scores of students taught by teachers with masters' degrees were higher than those taught by teachers with bachelors' degrees, (2) reading scores of students taught by teachers with 0-4 years of teaching experience were *lower* than the scores of students taught by teachers with five or more years of teaching experience and (3) there was no difference in reading scores of students taught by teachers self-identified as Highly Qualified Teachers and the scores students taught by teachers not self-identified as Highly Qualified Teachers. The scores of female students on composite scale scores were statistically significantly ($p. <05$) higher than the scores of male students in both 2007 (d=0.21) and 2009 (d=0.21). Females students' scores on the *Reading Literary Experience* subscale were also higher than male students; scores in both 2007 (d=0.27) and 2009 (d=0.28). On the *Reading to Gain Information* subscale in 2007, average scale scores of female students were higher than those of male students (d = 0.14). It is important to note that there was no difference by gender on the *Reading to Gain Information* subscale in 2009.

Kentucky's Teacher Quality Measures and Fourth-Grade Reading Achievement: A Secondary Analysis of 2002-2009 NAEP Data

On March 24, 2010, the Kentucky Department of Education (KDE) reported that Kentucky was one of three states that had a statistically significant increase in fourth-grade grade reading scores from 2007-2009 on the National Assessment for Educational Progress (NAEP). Additionally, NAEP fourth and eighth grade reading average scale scores for Kentucky surpassed the national average in 2009 (KDE, 2010). This was welcome news in the Commonwealth of Kentucky as there had been no increase in Kentucky's NAEP fourth-grade reading average scale scores for the prior fifteen years (Klecker, 2008).

Since 1999, NAEP average scale scores have been used in validation studies of Kentucky's accountability testing system (Koger, Thacker, Koger, & Deatz, 2003). Between 1992 and 1998, the NAEP average scale score on Kentucky's fourth-grade reading assessment increased only five points (Educational Trust, 2002). There were no statistically significant (*alpha* =.05) differences in the NAEP fourth grade reading average scale scores from 1992-2007 (Klecker, 2008).

Purpose of the Study

The purpose of this study was to examine the increase in Kentucky's fourth- grade reading scores on the National Assessment of Educational Progress (NAEP) from 2007 to 2009 after a fifteen-year period of no change. First, a secondary data analysis examined differences in fourth-grade reading scores by Kentucky's Teacher Quality Measures. Next the researcher examined NAEP 2007 and 2009 fourth-grade composite scores, and subscale scores--reading for literary experience and reading for information. The final analysis of the 2007-2009 NAEP data

examined gender differences as this persistent gap in reading achievement for fourth-grade Kentucky students has persisted.

Teacher quality measures. The No Child Left Behind Act (NCLB) (2002) included teacher quality as a major factor that impacts student learning. Teacher quality was defined by NCLB as credentials: (1) major/minor in subject area of teaching assignment, (2) completion of required degree, (3) certification in area of teaching assignment, (4) years of teaching experience.). Kentucky uses the NCLB 2002 definitions **(**KDE, 2006**).**

Researchers have found that the quality of the teacher in the classroom was the most important schooling factor predicting student achievement (e.g., Darling-Hammond, 2000; Darling-Hammond, and Sykes, 2003; Hanhushek, Kain, & Rivkin, 1998).Wayne and Youngs (2003) found strong links between the NCLB-defined teacher quality variables and student achievement. Klecker (2007) found statistically significant differences between teacher quality measures and students' 2005 NAEP national eighth-grade mathematics achievement.

The National Assessment of Educational Progress (NAEP) has since 1969, been the only nationally representative and continuing assessment of what America's students know in various subject areas. The No Child Left Behind Act (2002) required participation of all school receiving Title I money from federal funds. This requirement has enlarged the data base. In 2005, teacher questionnaire data were added to include the NCLB-defined teacher quality variables. However, in 2009, the teacher-quality question regarding the teacher's, "Type of Certification" was not available. However, a new question was added, "This school year, are you a Highly Qualified Teacher (HQT) according to your state's requirements?" (teacher-reported) ID: T096601, Values: Yes, At least 1 subject, No" (NCES, 2010). Results from the analysis by Teacher Quality variables are presented in Tables 2 through 5.

Framework for fourth-grade reading assessment. The framework for NAEP reading was changed for the 2009 assessments. NCES (2010) presented the following information about the changes:

> **The 1992–2007 framework**
>
> The 1992–2007 framework specified that the NAEP assessment should measure three contexts for reading: reading for literary experience, reading for information, and reading to perform a task (reading to perform a task at grades 8 and 12 only). In addition to reading within different contexts, NAEP reading comprehension questions were developed to engage the different approaches that readers may take in the process of trying to understand what is being read. The table below outlines the major aspects of the framework….(p. 1)
>
> **Comparison of the 1992–2007 and 2009 frameworks**
>
> The framework for the 2009 NAEP reading assessment replaces a framework developed for the 1992 assessment. Compared to the previous framework, the 2009 reading framework includes more emphasis on literary and informational texts, a redefinition of reading cognitive processes, a new systematic assessment of vocabulary knowledge, and the addition of poetry to grade 4…(p. 1).

NAEP Fourth-Grade Reading assessment data were available for the analyses presented in this paper as a composite score and two subscales scores: Gain information scale and Literary experience scale. NCES described the scales as:

> **Literary and informational texts**
>
> The NAEP reading framework specifies the use of both literary and informational texts. Literary texts include three types at each grade: fiction, literary nonfiction, and poetry.

> Informational texts include three broad categories: exposition; argumentation and persuasive text; and procedural text and documents. The inclusion of distinct text types recognizes that students read different texts for different purposes….(p. 1).

The results of the secondary analysis of the data from the 2007 and 2009 Fourth-Grade Reading assessments Kentucky are presented by composite and subscale average scale scores in Tables 1. 6. And 7.

Examining the gender gap in Kentucky's fourth-grade reading NAEP scores.

The analyses by subcategories by gender informed the areas for growth for continued improvement in Kentucky's reading achievement. Tables 8 through 10 present analyses by gender with strong evidence that the gender gap in Kentucky's fourth grade reading scores on the NAEP persist.

Method

Data Source

The National Assessment of Educational Progress (NAEP) has since 1969, been the only nationally representative and continuing assessment of what America's students know in various subject areas. The No Child Left Behind Act (2002) required participation of all school receiving Title I money from federal funds. This requirement has enlarged the data base. In 2005, teacher questionnaire data were added to include the NCLB-defined teacher quality variables (NCES, 2010).

Data Analysis

The author of this study attended training to analyze the unique NAEP data in June 2008. During this visit, the data analyses of NAEP of 2007 data were performed. For

the follow-up of the 2002-2007 and analysis of the teacher quality variables in 2007 data. For additional analysis of 2007 compared with 2009 NAEP scores, the researcher used --as advised by NAEP training staff-- the NAEP Data Tool available on the NAEP website. [IRB approval was obtained for this study.]

Table 1. Kentucky's 2007 and 2009 Fourth-Grade Reading NAEP Scores

Year	Average Scale Score	SD
2009	226	32
2007	222	34

The average scale score for 2009 (226) was statistically significantly higher p =.043 than the average scale score for 2007 (225), with an effect size of d=0.12.

Table 2. Major or Minor in Elementary Education by Fourth-Grade Reading Scores 2009

Variable	Average Scale Score	SD
Major in El. Ed.	226	32
Minor/special emphasis	225	29
Neither	225	34

Tested with an *alpha* level of .05, there were no statistically significant differences in the average scale scores of the variable categories.

Table 3. Highest Academic Degree by Kentucky's Fourth-Grade Reading Scores 2009

Variable	Average Scale Score	SD
Bachelor's Degree	221	33
Master's Degree	228	31
Education Specialist	223	32

Tested with *alpha* =.05, there was a statistically significant differences between the Average scale score of students whose teachers held a Bachelor's Degree (221) and the average scale score of students whose teacher held a Master's Degree (228) with an effect size, p =.013, d=0.22.

Table 4 Years Taught Elementary or Secondary by Fourth-Grade Reading Scores 2009

Variable Level	Average Scale Score	SD	Cohen's *d*
0-4 years	219	32	
5-9 years	226	32	d=0.22
10-19 years	227	31	d=0.25
20+ years	232	31	d=0.41

Tested with an *alpha* =.05, the average scale score of the 4th grade students whose teachers had 0-4 years of teaching experience (219) was statistically significantly lower than the average scale scores of students of teachers in the other levels of teaching experience. Effect sizes between 0-4 level of teaching experience and the other levels of years of teaching

experience are presented in Table 4. After their teachers had 5 years or more teaching experience, there were no statistically significant differences in their students' average scale scores..

Table 5. Highly Qualified Teacher (HQT) This Year by Students' 2009 4th Grade Reading Scores

Variable	Average Scale Score	SD
Yes	226	32
No	223	34

The average scale score of the 4th grade students whose teachers reported that they had met their state's standard as a Highly Qualified Teacher (HQT) in 2009, was not statistically significantly different from that of the students whose teachers were not HQTs. *p.* = ,297.

Table 1 presented the results of the Kentucky NAEP 4th Grade Reading average scale scores for 2007 and 2009 composite (total scale) score. Tables 6 and 7 below presents analyses of differences in the subscales.

Table 6. Reading to Gain Information Subscale of Kentucky's NAEP 4th Grade Reading Assessment for 2007 and 2009

Variable	Average Scale Score	SD
2009	225	33
2007	222	36

Tested with *alpha* =.05, the average scale score of students in 2009 was statistically significantly higher than the average scale score of students in 2007, p = .017, d=0.09.

Table 7. Reading Literary Experience Subscale on Kentucky NAEP 4th Grade Reading Assessment 2007 and 2009

Variable	Average scale score	SD
2009	226	34
2007	223	35

Tested with *alpha* =.05, there were no statistically significant differences between the average scale score on the Reading Literary Experience Subscale by Year, p = .184.

Table 8. NAEP Kentucky 4th Grade Reading Composite Scale Scores by Gender by Year

Variable	Average scale score		SD	
	Male	Female	Male	Female
2009	222	229	37	34
2007	219	226	35	32

Tested with alpha=.05, the average scale score of female students on the composite in 2009 (229) was statistically significantly higher than the average scale score of male students (222), p =..001, d = 0.20. In 2007, the average scale score of female students (226) was statistically significantly higher than the average scale score of male students (219), p = .001, d=0.21.

Table 9. Reading to Gain Information Subscale by Gender by Year

Variable	Average scale score		SD	
	Male	Female	Male	Female
2009	224	227	33	33
2007	219	224	37	35

Tested with *alpha* = .05, there was no statistically significant difference by gender in the 2009 average scale scores on the Reading to Gain Information subscale, $p = .061$. In 2007, average scale score of females (224) was statistically significantly higher than the males' average scale score (219), $p = .018$, $d = 0.14$.

Table 10. Reading Literary Experience Subscale by Gender by Year

Variable	Average scale score		SD	
	Male	Female	Male	Female
2009	221	230	33	33
2007	218	228	37	35

Tested with alpha = .05. In 2009, the average scale score of female students (230) was Statistically significantly higher than male students' average scale score (221), p = .001, d = 0.27. In 2007, female students' average scale score (228) was statistically significantly higher than male students' average scale score (218), p = .001, d=0.28.

Conclusions

The statistically significant increase in Kentucky's fourth grade reading average scale score on the NAEP should be celebrated. Although the increase is small, Kentucky's fourth and eighth grade reading scores surpassed the national average. The analyses by Teacher Quality Measures indicate:

- the reading scores of fourth-grade students taught by teachers with masters' degrees are higher than those of teachers with bachelors' degrees---and Ed.S. degrees had little impact on students' reading scores.
- The reading scores of students who were taught by teachers with 0-4 years of teaching experience were statistically significantly lower than the scores of students who were taught by teachers with five or more years of teaching experience. After five years of teaching experience by the classroom teacher, the scores of students did not significantly increase.
- There was no difference in the fourth-grade reading scores of students who were taught by teachers self-identified as Highly Qualified Teachers and the reading scores of students who were taught by teachers who were not Highly Qualified Teachers.

Gender differences. Female students' average scale score was higher than male students' average scale score on the composite scale for both 2007 and 2009 and on the Reading Literary Experience subscale for both 2007 and 2009.

The good news in closing the gender gap in reading scores: There was no statistically significant difference by gender in the 2009 average scale scores on the Reading to Gain Information subscale, $p = .061$.

As Kentucky moves to a national standards-based education in reading and mathematics (Senate Bill 1), instruction in Kentucky classrooms in fourth-grade reading is likely to be re-aligned. Clear progress is being made in reading instruction.

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